BJet Tagging: DCA3d

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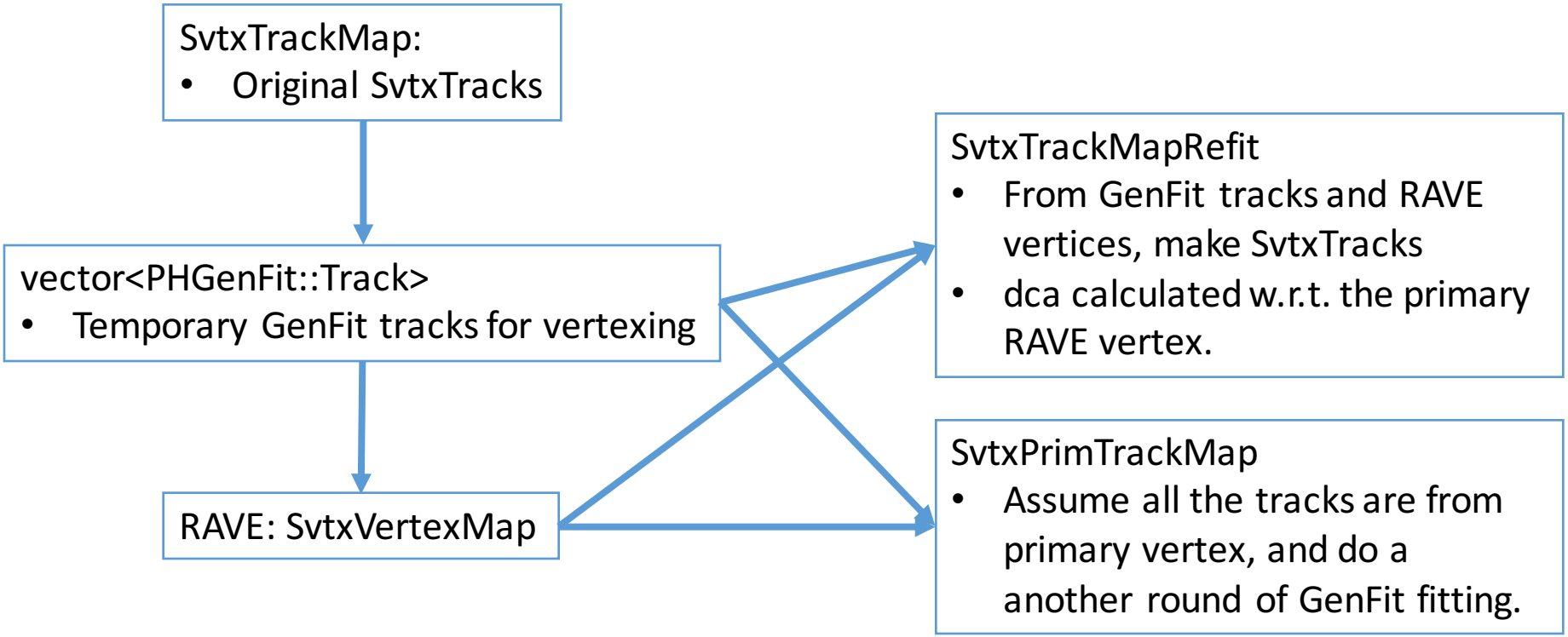
Refitting procedure



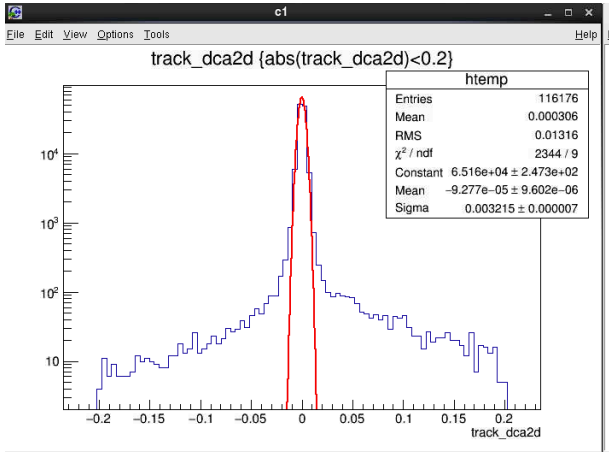
These was done using PHG4TrackKalmanFitter module in g4hough

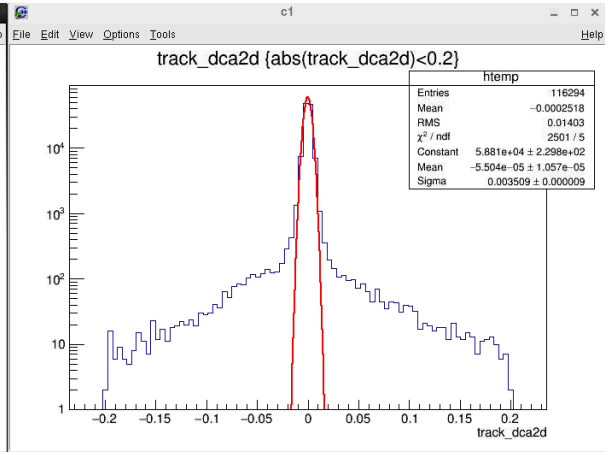
dca2d before and after genfit refit

Before refit

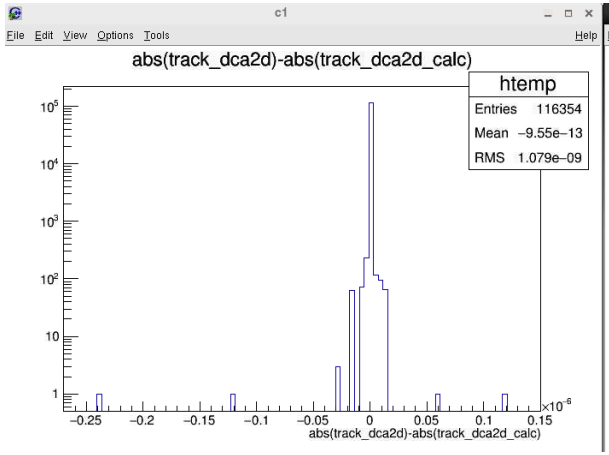
After Refit

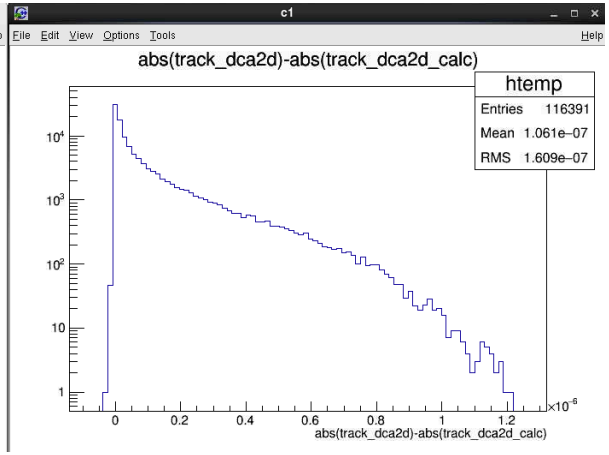
dca2d





dca2d compared with dca2d from strait line calculation



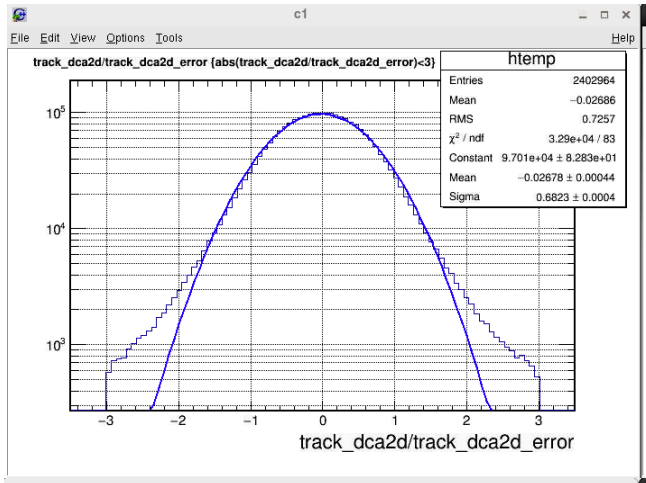


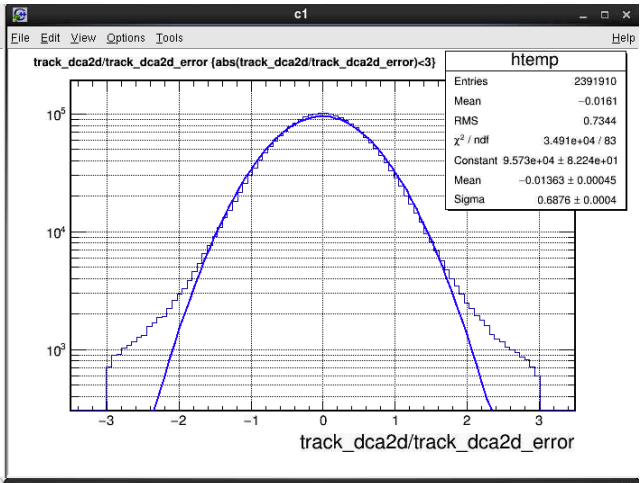
dca2d error

Origin

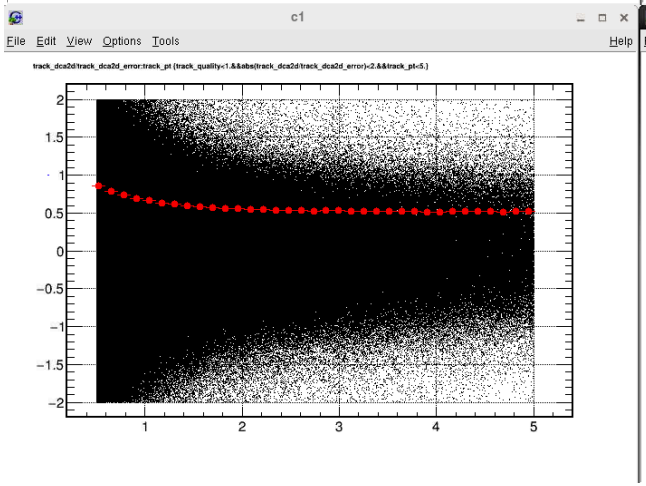
Refit

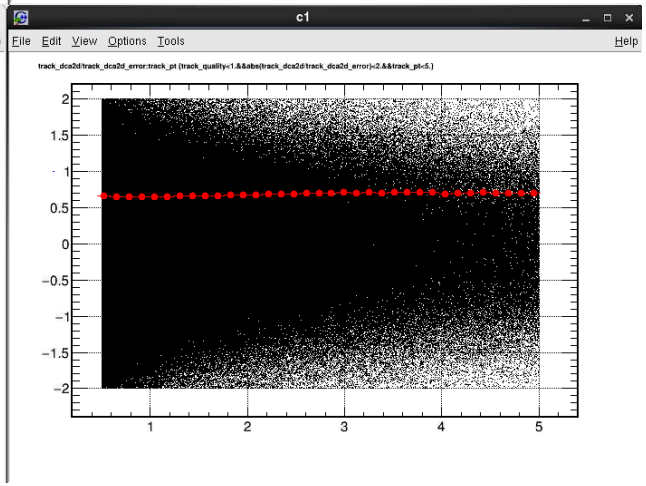
track-by-track dca2d/error





dca2d/error vs. pT





These refit results uses truth vertex(0,0,0) and zero errors for the vertex to isolate the DCA error itself. Same procedure used for the DCA3d plots.

dca3d calculation in GenFit

- GenFit can propagate a track to POCA (point of closest approach) of a designated point.
- The states at POCA is defined on a plane that go through the designated point, and perpendicular to the track momentum.
- A GenFit state is (1/p, u', v', u, v).
- dca3d := sqrt(u^2+v^2)
- dca3d_error := sqrt(cov(u,u) + cov(v,v)) → correlation between u and v ignored.

```
    |      0    |      1    |      2    |      3    |      4    |
-------------------------------------------------------------------
  0 |  8.525e-06    1.76e-07  -7.469e-10  -6.191e-07   2.688e-09
  1 |   1.76e-07   9.352e-07   9.084e-10   -2.86e-06  -2.227e-09
  2 | -7.469e-10   9.084e-10   1.249e-06  -1.759e-09   -3.75e-06
  3 | -6.191e-07   -2.86e-06  -1.759e-09   1.021e-05   5.241e-09
  4 |  2.688e-09  -2.227e-09   -3.75e-06   5.241e-09   1.273e-05

 defined in plane DetPlane: O(-8.20458e-05, -0.00253457, -0.000148107) u(-0.951812, -0.306682, 0) v(0.00823552, -0.0255596, -0.999639) n(0.306571, -0.951469, 0.0268536)
 3D position: TVector3 A 3D physics vector (x,y,z)=(0.000844,-0.002225,0.000251) (rho,theta,phi)=(0.002393,83.984788,-69.234855)
 3D momentum: TVector3 A 3D physics vector (x,y,z)=(0.742999,-2.333197,0.065779) (rho,theta,phi)=(2.449527,88.461215,-72.336101)
DEBUG: /phenix/hhj/yuhw//GitHub//HaiwangYu//coresoftware/simulation/g4simulation/g4hough/PHG4TrackKalmanFitter.C: 829: "Extrap to Vertex:" : Extrap to Vertex:
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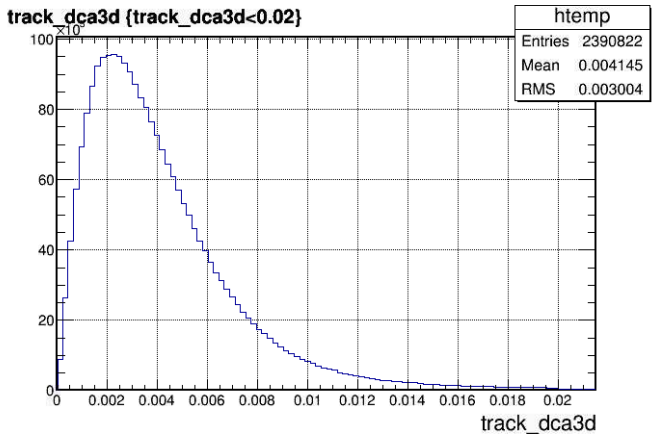
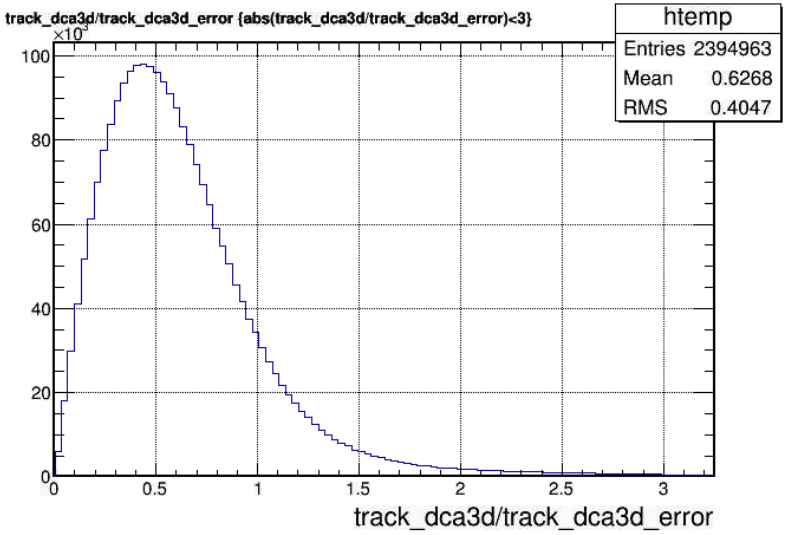
- n is the mom direction
- u always has one dimension set to be 0. could be x, y or z.
- u, v correlation is 3 - 4 magnitude smaller than their own error.

dca3d

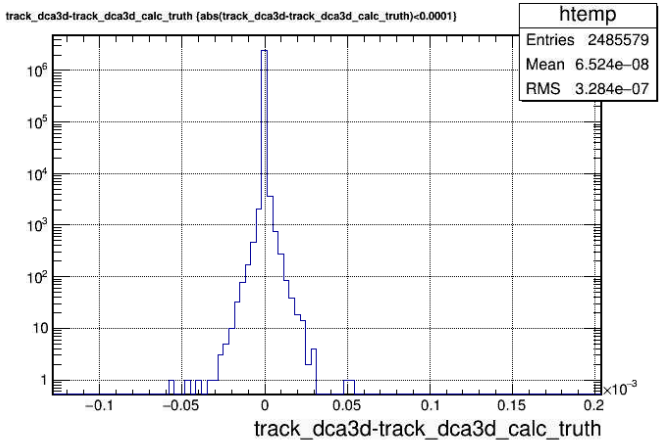
dca3d



dca3d/error



dca3d compared with strait line calculation



Backups:

10 events: simulation + BJetModule X 2 = 2min
1000 events: 200min